VOL. XII. NO. 4.—BOTANICAL GAZETTE.—APRIL. 1887.

Notes on Umbelliferæ of E. United States. III.

JOHN M. COULTER AND J. N. ROSE.

(WITH PLATE III.)

The range of Erigenia bulbosa, as given on page 15, *ante*, should be somewhat extended, so as to include Eastern Pennsylvania, along the Lower Susquehanna (*Porter*), and Tennessee (*Gattinger*). It is very much desired that botanists will not only assist us in thus perfecting the range of our species of Umbelliferæ, but also in providing good fruiting specimens. The failure of many of our best collections in fruiting specimens is somewhat remarkable, and we give this early notice, that all collectors, western as well as eastern, may take pains during the coming season to collect fruiting specimens of all the Umbelliferæ of their region. We already have to acknowledge the courtesy which has extended to us all needed assistance from the Harvard Herbarium and from the herbaria of I. C. Martindale, Thomas C. Porter, M. S. Bebb, Wm. M. Canby, Walter Deane, and S. M. Tracy.

LIGUSTICUM L.—Fruit ovate to oblong, not flattened either way: carpel with 5 equal strong primary ribs (sometimes winged), each with a group of strengthening cells: oil-ducts 2–4 in the intervals, 6 on the commissural side: seed-section somewhat dorsally flattened: stylopodium conical (figs. 27–30).—Smooth perennials, with aromatic roots and fruit, 2–3 ternately compound leaves, and white flowers.

1. **L. Scoticum** L. Spec. 250. Stem simple, 1–2 ft. high: leaves twice ternate; leaflets ovate, coarsely toothed; fruit narrowly oblong, 4–5 lines long: oil-ducts small, 2–3 in the intervals; seed-section nearly semicircular (figs. 27, 28).—Salt marshes, New England. Fl. August.

2. **L. actæifolium** Michx. Fl. i. 166. Stem branched above, 2–6 ft. high: leaves thrice ternate; leaflets broadly oblong, coarsely serrate: fruit ovate, 2–3 lines long; oil-ducts large, 3–4 in the intervals; seed-section pentagonal (figs. 29, 30).—Rich ground, S. Pennsylvania to Kentucky and southward. Fl. July and August.

TIEDEMANNIA DC.—Fruit ovate to obovate, flattened dorsally: carpels with 5 primary equidistant ribs; dorsal and

intermediate filiform; lateral extended into broad wings, closely contiguous to those of the other carpel, forming a winged margin to the fruit, nerved dorsally at the inner margin, giving the appearance of five filiform ribs on the back of each carpel; strengthening cells under each rib and nerve: oil-ducts solitary in the intervals, 2–6 on the commissural side: seed-section oblong to broadly oval: stylopodium short, thick, conical (figs. 31–36).—Smooth erect aquatic herbs, with leaves reduced to petioles or of few narrow leaflets, involucre and involucels present, and white flowers. Eastern species. Including *Archemora* DC.—Bentham and Hooker have included both Tiedemannia and Archemora under Peucedanum. They are very distinct in habit from our own Peucedanums, which are low dry ground western forms, with much dissected leaves and mostly yellow flowers. The fruit characters still further confirm this difference of habit, the carpels being much more flattened dorsally in Peucedanum, giving a narrow seed-section, the lateral wings nerved ventrally (on commissural side) instead of dorsally, thus giving the appearance of but 3 filiform ribs on the back of each carpel, the stylopodium depressed or wanting instead of conical, and no involucre. These characters seem sufficient not only to separate Tiedemannia and Archemora from Peucedanum, but to unite them into a single genus. No fruit character can be made to separate them, and the only distinction would have to be drawn from the leaves, and this breaks down in the intermediate Archemora ternata. So many salient characters unite Tiedemannia and Archemora, and so few can be made to separate them, that it seems best to consider them a single genus, and one well distinguished from Peucedanum, at least in North America. Archemora Fendleri of the south-west is probably not a member of the genus.

1. **T. teretifolia** DC. Mem. Umbel. 51, t. 12. Stem hollow, 2–6 feet high: leaves reduced to cylindrical hollow pointed nodose petioles: oil-ducts filling the intervals, 2–4 on commissural side (figs. 31, 32).—Virginia to Florida and Louisiana. Fl. August to September.

2. **T. ternata.** Stem slender, 2 feet high: leaves ternate, with linear entire leaflets, the lower long petioled, or sometimes reduced to a flat-tipped petiole: oil-ducts smaller, 4 on commissural side (figs. 33, 34). *Archemora ternata* Nutt. —North Carolina to Florida. Fl. November.

3. **T. rigida.** Stem 2–5 feet high: leaves simply pinnate, with 3–9 linear to lanceolate entire or remotely toothed leaflets:

oil-ducts small or sometimes large, 4–6 on commissural side (figs. 35, 36) *Archemora rigida* DC.—New York to Minnesota and south to the Gulf. Fl. August.

PEUCEDANUM L.—Fruit roundish to oblong, much flattened dorsally: carpels with 5 primary ribs; dorsal and intermediate filiform and approximate; lateral extended into broad wings, closely contiguous to those of the other carpel so as to form a winged margin to the fruit, strongly nerved ventrally (on commissural side) at the inner margin; strengthening cells under each rib and nerve: oil-ducts 1–3 in the intervals, 2–6 on the commissural side: seed-section much flattened (figs. 37, 38).—Dry ground acaulescent (or short caulescent) herbs, with fusiform roots, dissected leaves, no involucre, mostly yellow (sometimes white) flowers, and stylopodium depressed or wanting. Western species.—The strong nerve on the commissural face of the lateral wings seems to be a constant and distinctive character, taking the place of the dorsally placed nerve on the lateral wings of Tiedemannia.

1. **P. nudicaule** Nutt. Torr. & Gray, Fl. i. 627. Low, nearly acaulescent, pubescent: leaves much dissected: flowers white: fruit nearly round, 2–3 lines broad; oil-ducts small, solitary in the intervals, 2–4 on the commissural side.—Minnesota to Iowa and westward. Fl. in earliest spring.

PASTINACA L.—Fruit oval, very much flattened dorsally: carpels with 5 primary ribs; dorsal and intermediate filiform; lateral extended into broad wings contiguous to those of the other carpel, strongly nerved towards the outer margin; strengthening cells continuous about the seed cavity and under the nerves: oil-ducts small, solitary in the intervals, 2–4 on the commissural side: seed-section very much flattened: stylopodium depressed (figs. 39, 40).—Tall stout biennial, with pinnately compound leaves, mostly no involucre, and yellow flowers.

1. **P. sativa** L. Stem grooved: leaflets ovate to oblong, cut-toothed.—Introduced everywhere. Fl. July–September.

Bentham and Hooker include Pastinaca under Peucedanum, although the fruit characters are quite distinct and almost identical with those of Heracleum. In fact, were it not for the remarkable petals of Heracleum and its conical stylopodium Pastinaca could not be distinguished from it. In comparison with Pencedanum the fruit of Pastinaca is

much more dorsally flattened, the lateral wings are strongly nerved towards the outer margin, instead of at the inner margin on the commissural side, and a remarkable layer of strengthening cells completely invests the seed cavity, instead of occurring in small isolated groups beneath each rib, all of which characters are shared with Heracleum. As of minor importance the habit of Pastinaca is not that of Peucedanum, but rather that of Heracleum. Pastinaca is thus characterized by the fruit and habit of Heracleum and the floral character of Peucedanum, and had better stand as an intermediate genus. The length of the oil-ducts, a character sometimes used, is far from constant. In Peucedanum they are generally as long as the fruit; in Pastinaca sometimes as long and sometimes shorter; in Heracleum generally about half as long, though sometimes nearly as long.

HERACLEUM L.—Fruit oval, somewhat narrowed at base: like *Pastinaca*, but with thick conical stylopodium (figs. 41, 42).—Tall stout perennial, with ternately compound leaves, deciduous involucre, white flowers, and obcordate petals, the outer ones commonly larger and 2-cleft.

1. **H. lanatum** Michx. Fl. i. 166. Woolly, stem grooved: leaflets broad, irregularly cut-toothed.—Wet ground, throughout the northern states, and as far south as North Carolina and Kentucky; also westward. Fl. June.

EXPLANATION OF PLATE III.—Figures 27, 29, 37, 39, 41, are $\times 4$; figures 31, 33, 35, are $\times 6\frac{1}{2}$; all cross sections are $\times 20$.

A Botanical Tramp through North Carolina.

GERALD M'CARTHY.

After spending some five or six days in botanizing in the Tar river country, I shipped my presses, etc., by wagon, to Newberne, about forty-five miles farther south, and followed on foot, with portfolio and box, prepared to collect along the way. The road over which my route lay extended for the greater part of the forty-five miles through a series of gum and cypress swamps. These swamps had been flooded by recent heavy rains, and were now aggregated into one vast quagmire. Long stretches of the road were covered, often to a depth of three feet, by the coffee-black water of the swamps, and in places was crossed by deep streams, which connected the basins of the different swamps. Bridges are

everywhere absent, the only means provided the foot-passenger for getting across such places being what is called the "foot-log." The foot-log causeway is a characteristic institution of subaqueous Carolina. It consists of logs, usually of bald cypress, strung across the stream, and supported at the ends by piles driven a few feet into the soft ooze beneath. The upper surface is chipped off, so as to furnish a level and slippery pathway of some twelve to sixteen inches breadth. Frequently, after getting half way across some wide lagoon or stygian stream, the wayfarer is confronted by a yawning chasm, where the connecting logs have been swept away by the rising flood. It may be, too, that the twilight is fast deepening into the Egyptian darkness of the cypress swamp. Then the belated traveler must wade if he can, swim if he must.

The most abundant trees of all this wet region are the valuable black gum and bald cypress. The latter often rises to a height of over one hundred feet, and attains a girth of twenty-five feet or more above the swollen base. Where the trunks are not overcrowded, each one is surrounded by a palisade of cypress knees. The use of these curious excrescences can perhaps be explained by some of our biologists. Some one has suggested that they are intended to protect the sapling tree from injury by floating ice, a service, indeed, they are well fitted to perform, only it must be remembered that ice and the current to give it momentum are both usually absent from cypress pools. It may be, however, that the swamp water, which has a strongly acid reaction, acting upon the soft, spongy texture of the wood, has something to do with the production of these apparently useless appurtenances, as well as the swollen base of the trunk itself.[1]

The cane, Arundinaria macrosperma, mingled with Scirpus lacustris, Typha latifolia, and Smilax laurifolia, forms an impenetrable jungle along each side of the road, which it would soon invade were it not for the corduroying process.

Separating the basins of the different swamps are ridges of higher ground, usually with clayey soil. These ridges are often treeless, and are then covered by rank-growing sedges and aquatics. Among the sedges I noticed the following: Cyperus strigosus, C. retrofractus, C. Haspan, C. rivularis, C. flavescens, C. flavicomus, and C. Grayii, Dulichium spathaceum, Fuirena squarrosa, Eleocharis tubercu-

[1] The ordinary function assigned to "cypress kness" is that they permit the access of air to the roots. Also see BOTANICAL GAZETTE, viii. 286.—EDS.

losa, Eriophorum Virginicum, Fimbristylis spadicea, Rhynchospora inexpansa, R. alba, R. oligantha, R. microcarpa, R. pallida, R. gracilenta, R. Torreyana and R. glomerata. R. corniculata is rather scarce, but increases southward. Dichromena leucocephala, D. latifolia, Scleria triglomerata, S. oligantha, S. Elliottii, S. gracilis and S. laxa abound. Of carices the most common are C. flavescens, C. vulpinoidea and C. lupulina. This genus is by no means so well represented as one would expect.

But the flora of these lonely swamps is, like the swamps themselves, rather monotonous. The collector will often get as complete a set of species in a single day as he can secure by a whole week's labor, even though he force his way, as the writer did,

> "Through tangled juniper, beds of reeds,
> Through many a fen where the serpent feeds,
> And man never trod before."

There are very few grasses to be met with in the swamps, and these are of little interest. Panicum Crus-Galli, Agrostis vulgaris, Panicum dichotomum and Paspalum Floridanum are about all.

The shrubs and trees which sometimes cover the high ridges include Gordonia Lasianthus, Stuartia Virginica, Magnolia glauca, Cyrilla racemiflora, Oxydendron arboreum, Quercus aquatica, Q. Castanea, Alnus serrulata, Cupressus thyoides, Juniperus Virginiana, Acer rubrum, and one or two species of willow.

The Autumnal changes in Maple Leaves.

W. K. MARTIN AND S. B. THOMAS.

The results we would record in this paper were obtained from investigations conducted in the botanical laboratory of Wabash College. The work was done during the time of the autumnal changes, so that abundant and fresh material was constantly at hand. The object was chiefly to note the changes in the cell contents as the death of the leaf approached, and to localize, so far as possible, the changes in color.

The structure of the normal green maple leaf is shown in figure 1, consisting of the ordinary epidermal layer above and below, a single cell in depth, a single layer of rather

elongated palisade cells, and usually about three layers of spongy parenchyma, more closely packed than usual. The chlorophyll bodies are small and thickly and evenly distributed throughout the mesophyll cells.

The first indication of the approach of autumnal changes is the withdrawal of the contents of the mesophyll cells. This goes on gradually, but the cells are seldom emptied. The amount of protoplasmic cell contents lost to a plant by the fall of its leaves must be very considerable. The whole mass of the chlorophyll bodies in any cell is much reduced by this process of withdrawal (see figures 2 and 3). At the same time the protoplasm of the cell seems to dispose of much of

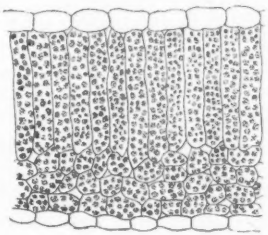

FIG. 1.

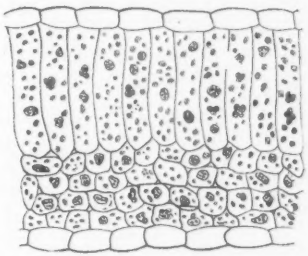

FIG. 2.

its substance in the manufacture of cellulose, chiefly in the palisade cells, in which it is deposited upon the cell walls in successive layers, either uniformly or in restricted patches, or is used occasionally in building a transverse partition across a palisade cell (fig. 4). In every case the lines of stratification are beautifully marked. That this deposit is cellulose was determined by the ordinary tests for that substance. During these changes the chlorophyll bodies are seen both to disintegrate and to blend together in larger masses. In the case of the red leaf these larger masses often become invested by a pellicle which appears to be cellulose.

In the leaf which has become brown (fig. 2), a greater amount of cell contents remain than in the red, the chlorophyll bodies do not mass together so much, and the cell sap is a dirty brown.

In the red leaf (fig. 3) the cell contents are even more reduced, some cells being almost empty, the remaining contents are mostly collected in masses of considerable size and

often surrounded by the pellicle referred to, and the cell sap is colored by the characteristic red coloring matter, erythrophyll.

In the yellow leaf the cell contents are much like those of the red leaf, but the cell sap is colorless and the chlorophyll masses are stained yellow by xanthophyll.

What has been said of red and yellow and brown leaves is applicable as well to groups of cells in the case of mottled leaves.

The existence of erythrophyll and xanthophyll in these positions, the former in the cell sap, the latter in the solid cell contents, is of course well known in a general way. But we wish to add an additional fact or two in the explanation of these phenomena. Chlorophyll, manufactured constantly under the influence of light, is as constantly undergoing decomposition by the metabolism of the cell. Under ordinary conditions the manufacture of chlorophyll is sufficient to cover up its decomposition and the leaf retains its green color. Under certain changed conditions, however, such as intense light or diminished vitality, the decomposition of chlorophyll exceeds its manufacture, and xanthophyll (probably one of the products of its decomposition[1]) appears. In other words, xanthophyll is being formed all the time, but only becomes apparent when the manufacture of chlorophyll is checked. The condition of intense sunlight gives us the occasional summer yellowness, while to lowered vitality must be attributed the failure of chlorophyll manufacture in the autumn. This lower vitality is brought about by diminution of light, lowering of temperature, and probably causes in the plant itself. The common notion that frost is the cause of autumnal coloration is true only so far as it is one of the causes which tends to diminish the vitality of the plant and so the manufacture of chlorophyll. Autumnal coloration may take place before any frost. Xanthophyll then stains the chlorophyll masses yellow, which were before stained green by chlorophyll.

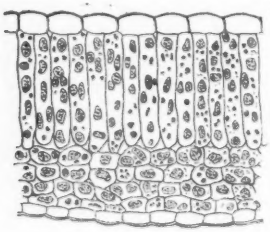

FIG. 3.

The red coloration is brought about in a very different way, as erythrophyll is manufactured in the leaf and stains

[1] Vines' Physiology of Plants, p. 241.

the cell sap, leaving the chlorophyll masses untouched. This red coloring matter can not be discovered in any of the crude materials brought into the plant, or in any other part than the leaves, except sometimes in the phloem regions of the petioles. When the leaf falls and the cell sap evaporates, and the chlorophyll bodies die, the erythrophyll lays hold of the cell wall and solid contents and stains them. In this way dried leaves retain their red color. As erythrophyll is soluble in water, however, contact with moisture will soon cause the most of it to disappear. In the case of many cells containing erythrophyll we found the chlorophyll masses retaining their green color. In fact, the green was so slow in disappearing that it was only in the most advanced stages that it had given place to the yellow of xanthophyll. In some cases, where chlorophyll masses were in contact with external cell walls, they had become yellow, while in the same cell those masses completely surrounded with erythrophyll remained green. The explanation of this seems to lie in the fact that in the red rays the decomposition of chlorophyll goes on less actively than in the rays of low refrangibility.[2] The erythrophyll thus acts as a check upon the decomposition of chlorophyll, and so on the appearance of xanthophyll. It thus seems that all the leaves would become yellow but for the presence of erythrophyll. The brown coloration seems to be a modification of the red, the erythrophyll color of the cell sap being replaced by a dirty brown. Whether this is a resultant from the action of erythrophyll upon certain cell contents, or an entirely different coloring matter, was not ascertained.

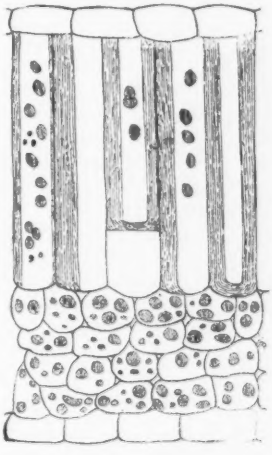

FIG. 4.

[2] Vines' Physiology of Plants, p. 266.

BRIEFER ARTICLES.

A Plant Heliostat.—The *Malva borealis* Wall. is a very common weed in cultivated ground throughout Southern California. It is an annual that quickly springs up in rich, tilled soil that is at all neglected. This "Malva," as it is appropriately called, is an almost constant stimulus to better culture, and stands ready to possess the soil, for a time at least, so soon as the harrow, gang-plow or hoe ceases to make frequent visits. The large areas in walnut groves, orange orchards, open fields for grain growing, and even along the roadsides, occupied by this weed, made any observations as to its habits an easy task. The most interesting characteristic of this mallow, which was noticed, is the heliotropic power possessed by the foliage. The round-cordate, neatly crenate and more or less five to seven lobed leaves follow the sun during its daily course, and present their upper surfaces to the descending rays. The position of the blades is facing eastward in the morning, and as the day advances the laminæ turn to the south and become more nearly horizontal. During the afternoon the blades approach the vertical position, and at sunset they face the western sky. In short, the malva leaves are living heliostats. This heliotropic movement is much more uniform in the leaves of young plants than in those that have grown old and woody. Over an area entirely covered with the malva plants that are about six inches high, and before any flowering stems have begun to shoot upward, the peculiarity of the leaves above noted is strikingly manifest to any person, however blunt his powers of observation, when once his attention is called to the matter.

A series of observations was made upon the movement of the leaves to determine, if possible, the portion of the blade that is most active in the turning, and also to discover the method of the return from the evening position to that assumed in the morning. By pushing small wooden stakes into the soil, and thus marking the position of a leaf at any given time, together with the use of strings tied upon the leaves, the changes could be determined. Frequent observations were required at all times of the day and far into the night. It was found that the point of torsion was located just below the blade in a short portion of the upper end of the petiole. At this place, averaging a line in length in the most active leaves, the petiole is of different color and texture from the remaining lower portion of the long petiole. The fibro-vascular bundles here converge from their several strands into one central tough thread, and the surrounding soft tissue is similar to that of a pulvinus in nyctotropic and sensitive plants. The exterior of this portion of the petiole is of a reddish brown color. The blade effects its daily turning at this place, and when night comes on it returns to its morning position by retracing the path taken during the day. In no case was there any indication of any attempt to make an entire revolution. The backward movement begins as soon

as the sun is set; in fact the following of the sun is not so pronounced after 3 o'clock (and earlier on dark days) as up to that hour. It seems as if the sun drew the leaf around by its own attraction, and the blade moves back to its point of rest when the force is withdrawn. There was no evident daily motion observed in the remaining portion of the long petioles. It is true that they varied their position from time to time, but with no regularity. Petioles on the eastern side of a plant remain more nearly horizontal than those located elsewhere. Those upon the north and south sides are more upright, with a tendency to point eastward. The western leaves are nearly upright, so that the blades may be able to catch the direct rays of the morning sun. At night there is an evident falling of the petioles as if to assume a position of rest, while the blades become nearly horizontal at the same time. By 9, or at most 10 o'clock in the evening the plant reached its position of repose, and an hour or more before the sun's morning rays can strike the plant the blades are all in position. Three distinct views of a malva patch may be obtained at any time when the sun is shining. If the view is, so to speak, from the sun, that is, in the direction of the rays of light, only the upper surfaces of the leaves are seen; if toward the direction of the sun, the under surfaces are in view. The difference between the shades of green of these two views is very marked. A third view is at right angles to the sun's rays, from which point the leaves are only seen by their edges, which are inclined from the perpendicular, the angle depending upon the height of the sun at the time of observation. Upon a dark, stormy day the heliotropism of the leaves is in a large degree suspended.—BYRON D. HALSTED, *Botanical Laboratory, Ames, Iowa.*

Leaf Prints.—Several years ago I devised a method of taking leaf prints of marked beauty, and a specimen of the work recently sent to Dr. Gray elicited the reply: "'Tis a new way; better send account of it to BOTANICAL GAZETTE," etc. I do so, prompted by the belief that the method may be of actual usefulness to the botanist as well as a refining recreation for those who love nature "on general principles." There will be needed for the work: 1. A small ink roller, such as printers use for inking type. 2. A quantity of green printer's ink. 3. A pane of stout window glass (the larger the better) fastened securely to an evenly planed board twice the size of the glass. A small quantity of the ink is put on the glass and spread with a knife, after which it is distributed evenly by going over in all directions with the ink roller. When this has been carefully done, the leaf to be copied is laid on a piece of waste paper and inked by applying the roller once or twice with moderate pressure. This leaves a film of ink on the veins and network of the leaf, and by placing it on a piece of blank paper and applying considerable pressure for a few moments the work is done, and when the leaf is lifted

from the paper the impress remains with all its delicate tracery, faithful in color and outline to the original.

To get the best results, however, several points must be carefully noted. Get a quarter or half pound of *dark* green ink, which is put up in collapsible tubes costing from 50 cents to $2 a pound, according to quality. As sold it is invariably too thick for this purpose, and should be thinned by adding several drops of Balsam Copaiba to as much ink as may be taken on a salt spoon. Much depends on the proper consistency of the ink. In inking, the leaf is apt to curl on the roller, but it should part readily from it. In case it sticks tightly, *the ink is too thick.* Take care that the ink is evenly distributed on the glass and roller, as it is essential that each part of the leaf receives an equal coating of ink. If the leaf is large, ink it part by part, keeping the roller supplied frequently. A roller three inches long, costing 40 cents, will answer for all small leaves and branches of plants (clean the roller with benzine after using). If the leaf is finely veined the lower surface makes the better print, but if the veins are coarse and large the upper surface may be used. If the specimen is fleshy or brittle, allow it to wilt until it becomes more pliable, or, if necessary, it may be pressed and dried first. In most cases the best copy is obtained after taking one or two impressions, as the leaf takes the ink better after several applications. A good quality of unsized paper that is made slightly damp by putting in a cellar several hours before using is best for general work, but in other cases well sized paper will take a copy that will allow a *foliotype* (may I coin the word?), to bear inspection side by side with a good lithograph. I find a little press very valuable in making the impression, especially if the leaf is at all coriaceous. If it be soft, it should be covered with a few thicknesses of newspaper. If it is irregular in thickness, paper may be laid over the thin parts so that equal pressure is received. This is necessary with all leaves that have thick stems. If the leaf or branch is very irregular or delicate, or in the absence of a press of any kind, the specimen may be covered with several layers of paper and held in place with one hand while the pressure is applied with the thumb or palm of the other hand as required.

These particulars are as complete as practicable; experiment will lead to many improvements in details. Employ tact and neatness and you will be surprised at the result. For illustrating monographs, and similar papers where the number is too limited to warrant an expensive lithograph, for identifying a rare specimen, or as an adjunct to an herbarium, combining portability, unalterability and beauty withal, the method seems particularly fitted. But aside from this, others may find a delightful and instructive recreation in taking prints of the entire flora of the old farm, the trees of a certain grove, the native annuals of a county, the ferns of a state, or any other special field that seems most

inviting. Such copies may be taken in a blank book suited to the purpose, or better, take them on single sheets of uniform size, as in this way imperfect copies may be thrown out, and when the work is completed they may be named, classified and bound, making a volume of real value and worthy of just pride. I would esteem it a favor as well as a pleasure to hear personally from any who may employ this method in any way the coming season, concerning the progress of their work, with its attendant imperfections and successes.—HORACE M. ENGLE, *Marietta, Pa.*

A method of staining Peziza specimens.—Decolorize the Peziæ by soaking in a solution of corrosive sublimate (1 to 2000 Aq. Dist.). Wash from precipitated calomel by agitation in distilled water. Macerate in 90 per cent. alcohol for twenty-four hours. For immediate examination, lower for a few seconds in a strong hæmatoxylin solution, wash in distilled water; or, if preferred, use the dilute hæmatoxylin fluid. (See Campbell, *ante*, p. 40.)—CHARLES E. FAIRMAN.

A visit to Washington.—A brief visit to the capital of the country recently gave an opportunity of inspecting some of the botanical work in progress under the auspices of the government, a short account of which may interest others.

The casts of fruits, vegetables and fungi, naturally colored, with other material illustrative of the vegetable kingdom, first attract the attention of the visitor, as he passes through the museum on the second floor of the Agricultural Building on his way to the herbarium. Entering the herbarium one is pleasantly greeted by the head of the Botanical Division, Dr. Vasey. During his fifteen years of service the botanical work of the department has expanded and developed new features, giving rise to two lusty offshoots, the Forestry Division and the Section of Vegetable Pathology.

The large double room of the herbarium is lined with tall cases filled with the 200,000 sheets, or so, of mounted specimens, with tables and low cases in the center for bulky specimens. In this room also are the desks of the assistants. The division is fortunate in having recently secured the services of Mr. Crozier, of Michigan, who is now engaged in preparing a catalogue of the North American desiderata. This will be heartily appreciated by the botanists of the country, enabling them to contribute desirable material, as they have long expressed a willingness to do, when they should be informed of the needs of the herbarium.

On the next floor above are the rooms of the Forestry Division. The work here does not profess to be botanical, but as it deals with trees, many of the problems being treated biologically, and employs several eminent botanists in the field, the botanists of the country will naturally take an interest in the work and its results. Mr. Sudworth, of Michigan, has recently been appointed assistant.

Adjoining rooms are occupied by the Section of Plant Pathology, under the care of Prof. Scribner. We found various diseased and injured parts of plants lying about, awaiting study. This work having but recently been begun the library and collections are small, but they are well selected and thoroughly indexed. The microscopic and other appliances show an appreciation of good tools. This room and the one on the floor above, occupied by the assistant, Mr. Erwin Smith, also of Michigan, have but lately become available for this use, being formerly occupied by the statistician, who now has rooms in the new seed building not far distant. Mr. Smith was working on diseases of potatoes, and other matters, carrying on cultures and making microscopic examinations.

On the upper floor are also the rooms belonging to the Bureau of Animal Industry; the one for the culture of bacteria, presided over by Dr. Theobald Smith may properly be considered to be partially botanical. There were the various appliances for thorough bacteriological work, and yet the rooms and furnishings are by no means as good as the importance of the subject should warrant. It is fortunate that pine tables and battened doors do not detract from the accuracy of scientific results secured in their presence.

In a broad gallery of the National Museum is another botanical quarter. There is a large herbarium here also, including American and foreign plants arranged in a single series, put up in a similar way to those at the Agricultural Department. But the chief interest lies in the work on fossil plants. Several workers are engaged under Prof. Ward in indexing the literature of the subject, which is put in card-catalogue form for the present, but eventually is to be printed. The amount of labor required is enormous, but the results will be of inestimable value to future workers. Series of specimens which are being studied are arranged in drawers. These are carefully selected, and then passed into the hands of assistants, who make drawings of them, working out with much patience every detail of the structure which the rock can be made to furnish. The weight of the specimens and the indistinctness of the impressions make the drawings desirable for comparison and study, while the specimens are always at hand for verifying doubtful points. Proofs of the plates to be used in the volume on the Types of the Laramie Flora, which is now in press, showed fine work, and some interesting features in photogravure.

In a room still higher up we met Mr. Knowlton studying the microscopic structure of fossil wood, the first work in this branch of paleobotany that has been done in a systematic way in this country. It is a surprise to find how perfectly the structure of some silicified woods is preserved, the drawings appearing as if taken from living plants. The preparation of the sections for study is not difficult, but consumes time; however the study is a fascinating one.

Lack of time permitted only a cursory inspection of these several centers of botanical activity, a glance into the plant houses at the Agricultural Department, and a sight of the Botanic Garden from the distance; and it may be that other botanical attractions in the city were entirely overlooked. Enough, however, was seen to make it clear that Washington contains many elements of botanical interest, and that valuable botanical work is being done there, directed by a coterie of genial botanists. Let fellow scientists pay the city a visit whenever convenient to do so, and they will be amply rewarded. – J. C. A.

EDITORIAL.

THE TWO EXTREMES of botanical teaching are frequently referred to. They may be called the ancient and the modern, and neither alone is productive of the best results. The subject is a much discussed one, but is never decided, the chief result being a settling down to some intermediate position which is likely to be the right one. When two methods of teaching have their acknowledged advantages, and when the only disadvantage of either is that it lacks the other, it would seem that the best method would be to combine the two, and thus obtain all the advantage and eliminate all the disadvantage. The ancient method gives a wide range of acquaintance with external forms, a general knowledge of the plant kingdom and its affinities, a living interest in the surrounding flora; but it disregards the underlying morphology of minute structures and chemical processes, the great principles which bring plant life into one organic whole. The modern method, on the contrary, takes a few types, carefully examines their minutest structures and life work, and grounds well in general biological principles; but it loses the relation of things, as well as any knowledge of the display of the plant kingdom in its endless diversity, and worse than all for the naturalist, cultivates no love for a flora at hand and inviting attention. The former is the method of the field, the latter of the laboratory. The wise teacher will adopt both methods and thus avoid the greatest disadvantage of either. The most natural way of combining the two seems to be to begin with the old method, an unrivalled one in awakening enthusiastic interest and kindling the naturalists' fire, and then to lead to the other. What naturalist has not begun with the fever for collecting? And to what more natural impulse in the young can appeal be made? Theoretically, the science of botany may be said to best begin with the study of protoplasm or Protococcus, but the natural order of the human mind in approaching the subject may be different. We venture to make the assertion that no competent teacher of botany is ever satisfied with the results from using one method

exclusively, and that no teacher, however strongly he may write or talk concerning modern methods as the only ones, fails to incorporate some of the old with the new. The botanical teaching of the future will consider these not as two opposing methods, but as complementary, both essential to the rounding out of a botanical course.

BEFORE THE botanical activity at our American colleges can be much increased, the Board of Trustees, Regents and Presidents must get rid of the prevalent and most pernicious idea that a college professor's time must be chiefly occupied by teaching. An acquaintance of the writer received lately an invitation to the botanical chair of a well-known Ohio college, in which, after reciting the duties of the chair, the President added: "As at present the professor's whole time will not be occupied, he may be asked to take also some additional work of a congenial nature." Why can not those in authority see that the giving up of the whole time to instruction is the chief cause of the lack of scientific spirit in our colleges as compared with those of Germany? Give any man who has the capacity for original research in him the time necessary for the prosecution of such work and in five years he will attract more students to the institution with which he is connected than he would by fifty years of the most commendable teaching. It is not the fame of DeBary the teacher, but of DeBary the investigator, that draws students to Strasburg. And it is so in every case. The host of German botanists, who might be named, attract American students, not because they are eloquent lecturers or faithful instructors, but because the German University demands that they spend the chief share of their time in conducting original investigation. When American colleges are willing to pay men living salaries, when they demand that *their* professors shall be able to conduct original researches, and when they allow time for the work, then shall we see botany and all the kindred sciences flourish. Such a college would be as a tree planted by the rivers of water!

OPEN LETTERS.

The Honzo Dsufu.

In looking over your note, p. 46, *ante*, on "A Japanese botanical work," I found some typographical errors in the name of its author, which should be Iwasaki Tsunemasa, or rather in your way of writing a personal name Tsunemasa Iwasaki. He lived in Tokyo, and devoted his time and attention to making illustrations of plants in the extensive collection of his own garden, and of those which he met with during his botanical tours and elsewhere. Most of his drawings were made from nature, and with such artistic skill and knowledge of the characters of plants, that one can determine the species with the aid of his plates with readiness and safety. This great work was finished in 1828. The arrangement of the work is after the classical Chinese herbal, the Honzōkōmoku. I think that there

are about a dozen complete sets now in existence, either in private or government possession. In the preface of the "Enumeratio Plantarum in Japonia sponte crescentium" by Franchet and Savatier, an account of the work is given at some length on pp. vi and vii.

Botanical Laboratory, Harvard University. K. MEIYABE.

Humblebees and Petunias.

In the October number of the BOTANICAL GAZETTE I noticed a note from Mr. Schneck, stating the manner in which the humblebees extract the honey from the flowers of Physostegia Virginiana, by making a slit in the base of the corolla. Following is a similar case: During last summer I noticed that the humblebees never attempted to enter the tubes of the common garden Petunia, but alighted on the upper side of the corolla, made a slit in its wall near the calyx and inserted their proboscis to extract the honey. The slits were about one-third of an inch long and were made by the bee pressing his mandibles against the corolla, and so forcing apart the tissue, which tears easily in a longitudinal direction. I have not yet noticed whether the flowers so mutilated are after all fertilized by other smaller insects entering the tube. GILBERT VAN INGEN.

Ithaca, N. Y.

CURRENT LITERATURE

Analytical Key to West Coast Botany, containing descriptions of 1,600 species of flowering plants growing west of the Sierra Nevada and Cascade crests, from San Diego to Puget Sound. By Volney Rattan. 12mo. 128 pp. A. L. Bancroft & Co., San Francisco, 1887.

The author is already known by his "Popular California Flora," and this is a continuation of the effort to bring the botany of the west coast within the reach of the schools. This "Analytical Key" is preliminary to a West Coast Botany for beginners, which is promised within three years. Umbelliferæ and Compositæ are omitted, and the more difficult monocotyledonous orders, but the names of the other species are placed within easy reach of beginners. This kind of work is very helpful to botanical science in general, and we expect it to result in a greater array of botanists than ever from the west coast.

Die natürlichen Pflanzenfamilien, by A. Engler and K. Prantl. Part I. Leipzig: Wilhelm Engelmann, 1887.

This is the beginning of a very extensive and important work, and the names of its editors assure botanists that it will be well done. It is intended to give an account of all the natural orders of plants, including their genera and principal species, and is fully and handsomely illustrated. Each order is to be monographed by a specialist, and thus the work will not only be of a high order, but probably completed within a reasonable time. This first part is devoted to palms, by O. Drude, and contains a full account of their distribution (geological as well as geographical), economic value, and structure, both vegetative and reproductive. Botanists will watch the progress of this work with great interest.

Manipulations de Botanique, guide pour les travaux d'histologie végétale. par Paul Girod. 72 pp., 20 plates. Paris, 1887.

This is one of the many books of to-day useful as laboratory guides. The first part briefly describes microscopic appliances and methods of using them. Then follow such subjects as "dicotyledonous stems," "monocotyledonous stems," "dicotyledonous roots," etc., all the way to algæ. Brief directions with each plant taken up, and a plate on the opposite page containing careful drawings of all the sections, clear troubles from the path of the student as completely as any laboratory guide we have ever seen. While by no means complete or explicit enough to serve the whole purpose of a laboratory guide in histological botany, it will be very useful to the advanced student as a book of reference, and in suggesting different lines of work.

Die fossilen Hölzer West Indiens, von J. Felix. Cassel, 1883.

This work, which has but recently been received in this country, is another one of the many valuable contributions of Dr. Felix to the interesting and difficult study of the internal structure of fossil wood. This department of paleobotany, which may be said to have had its origin in the year 1830, when Witham published his first observations, has, during the past few years, attained a remarkable activity in Europe, and particularly in Germany.

Several of the West Indian islands, and particularly the island of Antigua, have long been noted for their deposits of fossil wood, and many specimens had found their way into European museums from this locality. These specimens, through the kindness of the various curators, were placed at the disposal of Dr. Felix, and the results of their study is the present monograph.

Before proceeding to the detailed description of the species he remarks somewhat at length upon the difficulty attending the study of monocotyledonous and dicotyledonous wood as compared with that of coniferous. In the latter there are but three elements to be considered: "Tracheiden, Strang und Strahlen-Parenchyma," while in the former the tissues are numerous and complex, consisting of parenchyma, annular, spiral and scalariform vessels, wood cells, bast-fibres, etc. As the result of his personal examination of over four hundred living species, belonging to various families, the author concludes that a study of the histological structure alone is not in general sufficient for the identification of genera or species, since, as he says, different species of the same genus may differ so extraordinarily in their structure that, should one have them before him only in a fossil state, they would never be referred to the same genus. Again, species of different genera may so much resemble each other that, if known only in a condition of fossilization, they would undoubtedly be referred to the same genus; for example, Sophora Japonica, Robinia hispida and Gleditschia triacanthos; also different gen-

era in the same family may differ from each other in a very marked degree, as do the genera Amorpha, Sophora and Erythrina in the Leguminosæ. But, notwithstanding the difficulties in the way of specific or generic determination, the family can probably in all cases be recognized. The genera of fossil plants founded upon histological data must then be comprehensive. Salicinium, for instance, will include Populus as well as Salix.—F. H. KNOWLTON.

Handbook of Practical Botany. By E. Strasburger, Professor of Botany in the University of Bonn; edited from the German by W. Hillhouse, M. A., F. L. S., Professor of Botany, Mason Science College, etc. 8°. pp. xxiv, 425. London: Swan Sonnenschein, Lowrey & Co. 1887.

This book adds another admirable help to the study of plant anatomy in the laboratory. Teachers everywhere hailed with delight the appearance of the *Botanisches Practicum* of Strasburger, and, shortly after, of its abridgement, *Das Kleine botanische Practicum.* The translation and careful editing of the latter now puts a most excellent manual into the hands of English and American students—for it must be confessed (though with somewhat of shame) that most American college students can not use a German book with any profit. Most of our readers already know the arrangement and excellence of the book from the German edition. "The manual is divided into thirty-two chapters, each of which is intended to provide material for several hours' practical work in the laboratory. The earlier chapters are easy, and the difficulties to be encountered increase almost constantly up to the last chapter." To each chapter the editor has prefixed a list of materials necessary, and regrets that he did not also list the reagents to be used. Both are excellent ideas. The enlarged appendices, containing lists of reagents and notes on their preparation and use, are very valuable. Throughout the work the editor has interpolated phrases and paragraphs which serve to make clearer the author's meaning and supplement the study which he directs. The additional illustrations which are given are the ubiquitous ones from Sachs, DeBary and Prantl, which, though good, do not compare favorably with the fresh and beautifully executed originals of the *Practicum.*

As to translation, the work is perhaps as well done as usual, though it must be said that the English is not "the King's English." It is plain, however, that this is attributable to the influence of the German upon the translator. It is hardly possible for a man to translate from the German directly into good English, unless he be an exceptional scholar. One must either be content to write out the literal translation, lay it aside for several months and then reduce it to readable English, or let some one else correct the manuscript. Such sentences as these are not uncommon: "So much drawing ability as is necessary for this he may indeed possess, or can however readily obtain by practice the necessary facility." "So much water is also poured into the plate till the bell-shade has its lower edge quite immersed in it." Nor do we like some of the terms the editor

has adopted; such, for instance, as *fibro-vasal* for vascular or fibro-vascular. Was it an accident that all reference to the fact that this is a translation of "Das *Kleine* botanische Practicum," and not of "Das botanische Practicum," was omitted?

But aside from whatever slight faults the translation has—and what book is free from them?—the fact is that this work is certain to prove highly helpful to botanical students, especially to "those who, without desiring to become professional botanists, wish nevertheless to become acquainted with the elements of scientific structural botany." May their tribe increase! As our American colleges run, this will be an excellent book to put into the hands of a student who has completed the "Handbook of Plant Dissection." Finally the book is admirably manufactured. The limber binding, all but unobtainable in this country, is delightful.

The Principles of Pharmacognosy, an introduction to the study of the crude substances of the vegetable kingdom, by Friedrich A. Flückiger, Ph. S., M. D., Professor in the University of Strasburg, and Alexander Tschirch, Ph. D., Lecturer on Botany and Pharmacognosy in the University of Berlin. Translated from the second and completely revised German edition by Frederick B. Power, Ph. D., Professor of Materia Medica and Pharmacy in the University of Wisconsin. New York: William Wood & Co., 1887. 8vo. pp. xvi, 294, with 186 figures.

In presenting to American students a translation of a standard German work by authors of eminence in their department of applied science, Professor Power, a botanist of no small attainments, as well as an accomplished chemist, has rendered a considerable service to botanists. Aside from its value as a pharmaceutical handbook, this little volume, with its copious and accurate illustrations, is an admirable treatise on elementary vegetable histology, based essentially on Haberlandt's Physiologische Pflanzenanatomie. The work of the translator is well done; the type and wood cuts are excellent. The book should find a place in every botanical laboratory.—W. T.

Contributions to American Botany, XV. By Asa Gray. From Proc. Amer. Acad., xxii. pp. 270–314.

This contribution is largely concerned with a revision of certain polypetalous genera and orders precursory to this part of the Synoptical Flora. In Papaveraceæ three tribes are proposed, *viz.*, Platystemoneæ, Papavereæ, and Hunnemanniæ, and a revision of Eschscholtzia (nine species) is given. A new generic key is proposed for Portulacaceæ, and notes on all the genera with a revision of Claytonia, with twenty-one species, are given. In the consideration of the Malvaceæ the tribe Malveæ has its sub-tribes reduced to two, allowing Sideæ to include all the genera with capitate stigmas. A tentative arrangement is proposed for the perennial species of Sidalcea. The very closely related genera Malvastrum and Sphæralcea are still kept up, but with a new distribution of species. All those species are retained in Malvastrum in which there is no empty

terminal portion in the carpel, but the cell conforms to the solitary ovule and seed. This gives a Malvastriform section to Sphæralcea, and in our Rocky Mt. species, for example, Malvastrum coccineum retains its place, while Malvastrum Munroanum becomes Sphæralcea Munroana. *Horsfordia* is a new genus, between Sphæralcea and Abutilon, of two species. H. alata is Sida alata of Watson, and H. Newberryi is Abutilon Newberryi of Bot. Calif. A new order, CHEIRANTHODENDREÆ, is established, containing the genera Cheiranthodendron and Fremontia. Bentham first placed these genera in Malvaceæ, but later transferred them to Sterculiaceæ. Dr. Gray thinks it better to recognize the peculiarities of these genera, of which the leading one is the strongly quincuncial calyx, and not to force them into an order of which a valvate calyx is an essential and substantially an unvaried character. New species of Mr. Pringle's collecting are also described in addition to these under the heading "Miscellanea."

Outlines of Classification and Special Morphology of Plants. By Dr. K. Goebel. Translated by Henry E. F. Garnsey, and revised by I. B. Balfour. Oxford: Clarendon Press, 1887. pp. xii, 515.

The original of this new edition of Sach's "Text-book of Botany," Book II, has been in the possession of botanists since 1882, but this most helpful translation puts it within the reach of all English speaking botanists. There has been considerable delay in its publication, as the reviser's preface is dated 1885, but it is none the less welcome. The chief thought of the book seems to be to "make use of a consistent terminology based upon homology," a thing of great educational value, although there are some who may think it is not the best plan. For example, to call a pollen-grain a microspore may seem to be doing violence to a long established name, but when it is understood that the microspores of Phanerogams are called pollen-grains, there can be no objection to using the latter name as a special group-name, and at the same time retain the idea of homology. Objections of this kind are chiefly raised in the new terminology of Phanerogams, but the clear way in which this is stated, at the same time acknowledging the old names, can not be too highly commended. In fact, the whole treatment of Phanerogams is masterly, and is probably the most valuable contribution in the book, and should be carefully studied by every student of botany. The changes in the grouping of plants are known from the original German text, but it may be well to note them here. Four great groups are recognized, viz., THALLOPHYTES, MUSCINEÆ, VASCULAR CRYPTOGAMS, and SEED-PLANTS or PHANEROGAMS. It would seem more uniform to call the three last groups Bryophytes, Pteridophytes and Spermaphytes. Under Thallophytes five equivalent groups are recognized, which involves the greatest change from the original grouping as given by Sachs. *Myxomycetes* and *Diatomaceæ* are set apart as the first two groups, to which no serious objection will be made, unless

that it seems somewhat unnatural to separate diatoms and desmids so widely. The third group contains *Schizophyta*, while the fourth and fifth are *Algæ* and *Fungi*. The last two groups seem to show the widest departure from the original presentation of these plants. The teaching that the presence or absence of chlorophyll makes no special difference in the presence of morphological resemblances has been widely taught. However, the present use of these terms has not been absolutely restricted by the former distinction between algæ and fungi, and so morphological resemblance has not been slighted. The group *Algæ* is made to contain three sub-divisions, viz., *Chlorophyceæ*, *Phæophyceæ*, and *Rhodophyceæ*, or green, brown, and red seaweeds. *Fungi* contains six sub-divisions, viz., *Chytrideæ*, *Ustilagineæ*, *Phycomycetes*, *Ascomycetes*, *Uredineæ*, and *Basidiomycetes*. The second great group, MUSCINEÆ, comprises *Hepaticæ* and *Musci*. The third group, VASCULAR CRYPTOGAMS, contains *Filicineæ*, *Equisetineæ*, *Sphenophylleæ* (a fossil group), and *Lycopodineæ*. The grouping of SEED PLANTS is that which has been long familiar to botanists. Not the least valuable part of the book is the appended "Explanation of terms." Altogether, this work is the most valuable recent contribution in the English language to the classification and morphology of plants.

NOTES AND NEWS.

PROF. AND MRS C. S. SARGENT have gone to Mexico, via Key West and Galveston.

DR. ASA GRAY and wife sailed for Europe April 7. The Doctor goes chiefly to visit the Lamarck herbarium.

DR. C. S. SARGENT reports that 70,000 trees and shrubs have been planted at the Arnold Arboretum during the last year.

COOKE'S HANDBOOK of British Fungi, 2d edition, being issued as a supplement to *Grevillea*, has now reached page 192, and species 709 in the genus Agaricus.

DR. GRAY'S new book, to take the place of "How plants grow" and the "Lessons," which have done such yeoman service, is about ready for the press.

A. P. MORGAN gives descriptions and an analytical key to the species, twenty-four in number, of the North American Amanitas of the genus Agaricus, in the March *Journal of Mycology*.

THE *Gardener's Monthly* says that Dr. Rothrock has been compelled to take a year's vacation on account of his health. He will go south, spending the summer among the mountains.

THE WILMINGTON FLORA, by Thomas F. Wood and Gerald McCarthy, already noticed in this journal, has been distributed separately as a reprint from the Journal of the Elisha Mitchell Scientific Society of N. Carolina.

THOMAS HOWELL, of Arthur, Oregon, has just distributed a catalogue of the Phanerogams and Pteridophytes of Oregon, Washington, and Idaho. Mr. Howell is a well-known collector, and his catalogue is thoroughly reliable.

DR. LORENZO G. YATES (Santa Barbara, Cal.) has distributed his list, with notes, of the ferns of Ceylon. The catalogue contains extracts from manuscript notes of Dr. Thwaites, and the published works of Hooker, Baker, and Wall.

THE *Bulletin* of the Washburn College (Topeka, Kan.) laboratory of Natural History is an excellent publication, devoted to the natural history of the state. Its various numbers contain much information concerning the flora of Kansas, especially the cryptogamic flora.

PROF. W. R. DUDLEY, of Cornell University, will start in a few months for a year's study and travel in Europe. Cornell has the admirable regulation that a professor may take one year in seven, with half salary, for going abroad. Professor Dudley has taught in the University ten years, and well merits this opportunity for relaxation.

THE *Pharmaceutical Era* is a monthly periodical, begun with the year, and among other departments has one devoted to botany, under the charge of Charles F. Wheeler. Mr. Wheeler is well known as one of the authors of the Catalogue of Michigan Plants. The new periodical is edited by Dr. A. B. Lyons, is published at Detroit, and costs $1.50 a year.

WE REGRET to announce the death of Dr. Eichler, of the University of Berlin, and Director of the Botanic Garden, where he succeeded Alexander Braun. Through his editorship of the *Flora Brasiliensis*, succeeding von Martius, his researches among Coniferæ and other orders, and his *Blüthendiagramme*, he is one of the most widely known of our botanists.

HORTICULTURAL NOMENCLATURE is the subject of an article by Prof. L. H. Bailey, Jr., in *Agricultural Science* for March, in which he advises the use of English for the part of the name referring to the cultural condition, or, if Latin must be used, to separate the parts of the name denoting the cultural and natural condition of the plant by a comma, or the abbreviation "hort.," but not by "var."

PART III. (Oct.–Dec., 1886) of the Proc. Philad. Acad. contains several articles of botanical interest, as follows: History and biology of pear-blight (conclusion), J. C. Arthur; Notes on the lichens in the herbarium of the Academy, J. W. Eckfeldt; On the interdependence of plants, and Petiolar glands in some Onagraceæ, Thomas Meehan; On hæmatoxylin in the bark of Saraca Indica, Miss H. C. De S. Abbott.

IT WAS a happy and fruitful thought which led B. A. Elliott & Co., of Pittsburg, to attract the attention of the public to the stock in which they deal by issuing the handsome work on "A few flowers worthy of general culture." It is a small quarto, profusely illustrated with artistic engravings, and with an interesting text quite free of shoppy flavor, advocating the use of hardy plants for the lawn and garden, including native sorts.

IN THE *Torrey Bulletin* for March, Arthur Hollick and N. L. Britton give an account of *Cerastium arvense* L. and its North American varieties, accompanied by three plates, one of them colored. Some six varieties are described, two of which are new, and one of these is C. oblongifolium of the Manual. A full synonymy and bibliography are given. In the same number Mr. Thomas Morong describes a new Eryngium from Louisiana.

IN *Science* for March 11, Mr. B. E. Fernow enters his protest against the sweeping judgment of Professor Sargent condemning foreign trees. He calls attention to the facts that forestry and arboriculture are not the same thing, and that New England is not all of the United States. With forest conditions and in other regions of our great domain Mr. Fernow claims that it remains to be seen whether the cultivation of foreign trees will be profitable.

THE HISTORY of the currant is treated by Dr. E. L. Sturtevant in the Proceedings of the N. Y. Hort. Society for 1887. The author traces it among the early horticultural writers, especially the pre-Linnæan herbalists, it being first mentioned by Ruellius in 1536. His conclusion is that "the currant fruit has not changed at all in type under culture, but has furnished variety characteristics in increased size, diminished seed and improved quality."

IN THE *Journal of Botany* for March, B. Daydon Jackson gives an interesting account of the preparation of the new "Index of plant-names," a work of tremendous labor and of equal importance. Some idea of its magnitude may be estimated from the statement that "rather more than 30,000 covers were required for the genera, and the whole of the MS. is accommodated in 178 boxes, housed in two sets of pigeon-holes; the entire MS. is computed to weigh rather more than a ton."

NOTES ON microscopical methods for the use of students in Cornell University, prepared by Prof. S. H. Gage, cover the requirements of general microscopical instruction in a thorough and serviceable manner. The work, illustrated with nearly a dozen lithographic diagrams, is an ample introduction to the use of the microscope and its accompaniments for students in either animal or vegetable histology. It is intended by the author to be used with his notes on histological methods, published a year ago.

THE SUMMER SCHOOL of Harvard University will be held at the Botanic Garden, Cambridge, Mass., beginning Wednesday, July 6th, and ending Saturday, August 6th. The course has been planned with reference to the needs of teachers, and will include laboratory work in the morphology of phanerogams and cryptogams, under the direction of Mr. James E. Humphrey. Professor Goodale will lecture on the morphology and physiology of phanerogams, and Mr. Humphrey on the morphology and classification of cryptogams.

THE *American Naturalist*, though long delayed, makes its appearance doubly welcome by an entirely new dress. It is to be congratulated upon its improved appearance. The botanical articles are "Parasitic bacteria and their relation to Saprophytes," by Theobald Smith, and "History of garden vegetables," by E. L. Sturtevant. In the botanical department we find "Pollen-tubes of Lobelia," "The tree-trunk and its branches," "The article 'Schizomycetes' in the Encyclopædia Britannica," and an account of the various botanical journals.

THE December number of the *Journal of the New York Micros. Society*, received the middle of March, closes the second volume. The journal barely maintains the promise of its beginning. The leading articles of the present number are singularly elementary in tone, as if addressed to amateurs. It is accompanied by a supplemental number devoted to experiments in raising diatoms in the laboratory, by Rev. Samuel Lockwood. This is one of the most valuable articles yet published, and recounts the tests by which it was proven that several species of diatoms could be grown from minute resting spores after the lapse of fourteen to sixteen years.

DR. GRAY'S opinion regarding the capitalization of plant names was recently secured by a correspondent of the *American Florist*, and the following extract from it may be of interest to botanists: "No botanist writing in the English or Latin language would ever write the name of a genus, say Rosa or Begonia, without a capital initial letter. But if any one is writing generally about roses, or begonias, or phloxes, or such

names, which you use as English plurals, it is simply a matter of taste and usage whether to use a capital or small initial. There is a strong tendency to the latter, and I see no harm in it. I do not fall into that custom in my books, partly for this reason: When I write Strawberry, Flax and Wheat, I mean the plant so called; and when I write strawberry, flax or wheat, I refer to the fruit, fibre or grain, and when I write rose I mean the flower, not the plant. This I find convenient and useful; but the common usage seems to me perfectly proper."

THE GOVERNMENT appropriation for the fiscal year ending June 30, 1888, to support the botanical part of the Department of Agriculture, is $15,440. Of this sum $9,400 goes to the Section of Plant Pathology (as the *Section of Mycology* is henceforth to be known), and $6,040 to the remainder of the Division of Botany. The appropriation for the present fiscal year was $8,200, inclusive of the mycological part, and for the preceding year, $3,000. If memory is not at fault, earlier annual appropriations never exceeded the last figure. Those who know about the expenditure of this money, know that good use is made of it, and feel gratified at the evidences of increasing usefulness.

A RECENT WORK on British Fungi by W. D. Hay, called an elementary text-book, proves, upon examination, to be neither elementary nor a text-book in any proper sense, but a semi-popular treatise on edible fungi. Whoever essays to use it, however, should first be master of the subject in order to check the author, whose statements are frequently not above criticism. One is prepared for this upon finding that the author acknowledges no help, and says that he has "never met with any person versed in mycology." The source of the fifty-nine plates, forty-four of which have no connection with the text, is not divulged, but any one familiar with the works of the more prominent mycological writers could guess closely. It seems probable that the publishers, a good firm, have been caught napping.

IN A RECENT meeting (Jan. 20) of the Linnean Society, Mr. J. R. Vaizey read a paper on the morphology of the sporophore in mosses. The "central strand," surrounded by a single layer of cells is composed, as is well known, of an outer cylinder of elongated cells with somewhat thickened walls and a central region of smaller thin-walled cells. The former Mr. Vaizey calls *prophloem*, the latter, being conductive of water, *proxylem*. This proxylem only differs from the xylem of vascular plants "in the absence of spiral thickening and lignification of the cells." "The prophloem differs still less from phloem," though no sieve tissue has been discovered; but this is lacking in some vascular plants. The conclusion drawn is that mosses and vascular plants have descended from a common ancestor, similar to the Anthocerathæ.

AT A MEETING of the Linnean Society of London, January 20, 1887, a paper was read by Francis Darwin and A. Bateson upon "The effects of stimulation on turgescence in vegetable tissues." The important results announced are summarized as follows by the *Journal of Botany:* (1) Turgescent pith placed in water increases in length, at first slowly, then more quickly, and then again the rate of increase becomes slow; (2) the rate of increase in length increases as the temperature of the water rises, reaches an optimum, and suddenly falls as a temperature sufficient to cause flaccidity is reached; (3) the following reagents cause distinct acceleration, *viz.*, alcohol, ether, ammonia and hydrocyanic acid; the first three a very temporary effect, whereas prussic acid has a prolonged action; (4)

the following reagents produce retardation, *viz.*, acetic acid, hydrochloric acid and probably nitric acid; (5) dilute solutions of quinine, of quinine chlorate, and carbolic acid produce a remarkably rapid shortening of the pith.

DR. A. GATTINGER has just distributed copies of the "The Tennessee Flora," containing the Phanerogams and Pteridophytes of that state, with special reference to the Flora of Nashville. There are few regions more interesting, botanically, than Tennessee, and no botanist more competent to write of its flora than Dr. Gattinger. The summary shows the list to number 1,708 species and varieties. Several new species have been recently described from Tennessee, discovered by Dr. Gattinger, as for example, two Leavenworthias, a Hypericum, a Silphium, a Solidago, etc. An unfortunate oversight is that some of these new species appear as if described in this catalogue for the first time, when the original descriptions have been previously published elsewhere. For instance, Hypericum lobocarpum and Silphium brachiatum were both originally published in the BOTANICAL GAZETTE, but there is nothing to indicate it in the catalogue, where they are described as new species. The catalogue will be welcomed by botanists as containing the first full record of the plants of a very rich flora.

THE CONTRIBUTIONS of Dr. Asa Gray to the Proceedings of the American Academy of Arts and Sciences embrace a very large number of original descriptions of American plants and critical notes on the same, with which every systematic botanist desires to be acquainted, and to such the following list will prove serviceable. This does not include papers published in the memoirs of the society, which are alluded to in the Proceedings, or of remarks reported by the secretary. The two papers of 1860 are abstracts of observations on natural selection, about which much discussion arose in the Academy at the time, and are not strictly botanical. The articles began to be called *Contributions* with volume IX. As stated in a previous issue, the author, upon solicitation, has consented to place some of the remaining numbers in the hands of the Curator of the Harvard Herbarium, from whom they can be obtained at thirty-five cents each.

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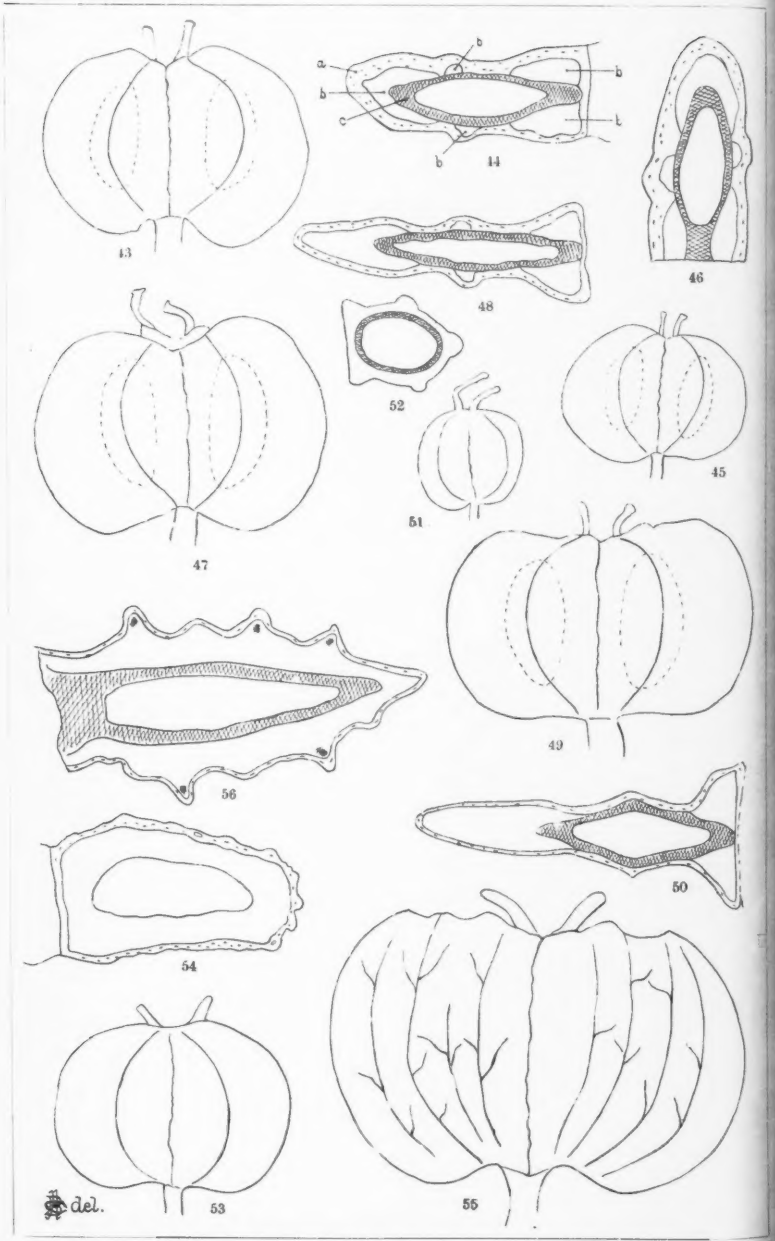

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